DUAL PLATFORM LOCATION-RELEVANT SERVICE

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BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a location-relevant service; in particular, the present invention
15 relates to a location-relevant service accessible by multiple mobile devices.

2. Discussion of the Related Art

~~Location-relevant services, which provide~~
20 information or perform services based on the geographical location of a mobile client, are becoming more available. A location-relevant service can be used, for example, by a trucking company to track the positions of its vehicles in service. Another
25 application of location-relevant systems is to provide travel-related services (e.g., driving directions) based on the position of the client. One example of a location-relevant service is described, for example, in copending U.S. patent application "Method for
30 Distribution of Locality-Relevant Information using a Network" ("Copending Application"), serial no. 09/422,116, filed October 20, 1999. To provide an example regarding the architecture and application of a location-relevant information system, the disclosure of
35 the Copending Application is hereby incorporated by ~~reference in its entirety.~~

Typically, a location-relevant system includes a location-relevant service server accessible by multiple mobile units over a communication system, which includes wireless links to the mobile units. The

5   mobile units provide their positions based on a positioning system. The position of a mobile unit can be provided by, for example, the Global Positioning System (GPS) or, in a cellular telephone network, by a process called triangulation which is based on signal

10   delays from system base stations of known fixed locations. Due to technology limitations at the present time, it is costly to integrate the capabilities of both positioning and wireless communication of such a mobile unit into a hand-held

15   device. In addition, hand-held positioning devices are also typically less accurate than their more sophisticated bulky counterparts. Therefore, a mobile unit in a location-relevant service is typically fixedly installed on a vehicle. However, a mobile unit

20   fixedly installed on a vehicle cannot provide the convenience and mobility of a hand-held unit.

Another desirable application that is not known in the prior art is accessing from a mobile unit location-relevant service based on the position of another

25   mobile unit.

SUMMARY OF THE INVENTION

The present invention provides a location-relevant service system which includes (a) a location-relevant

30   service server accessible over a data network (e.g., the Internet); (b) a first mobile unit coupled to the data network over a first wireless link which provides a position of the first mobile unit over the wireless link to the location-relevant service server; and (c) a

35   second mobile unit coupled to the data network which receives from the location-relevant service server

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location-relevant service based on the position of the
first mobile unit. In one embodiment, the second
mobile unit couples to the location-relevant service
server over a second wireless.link independent of the
5   first wireless link. Alternatively, the first and
second mobile units can share the first wireless link,
which can be provided by either of the mobile units.
Further, the first and second units can also
communicate over a direct wired or wireless link. In a
10   wired link environment, the wired link can be provided
through a docking station in the first mobile unit
adapted for accommodating the second mobile unit. The
electrical interface between the first and second
mobile units under such an arrangement can be provided
15   by a standard interface, such as an industry standard
serial bus commonly found in portable devices, such as
a cellular telephone, lap top computer or a personal
digital assistant.

     The location-relevant service system of the
20   present invention can operate in at least two modes:
on-demand or "pushed." Under on-demand operation,
location-relevant service is provided in response to a
query received from the second mobile unit.
Alternatively, under the pushed operation either the
25   second mobile unit or a non-mobile unit can request a
selected location-relevant service to be provided to
the second mobile unit upon occurrence of predetermined
events, or satisfaction of certain conditions (e.g.,
during a specified time period).

30   Location-relevant services can provide such
information as traffic conditions, entertainment
information, or travel-related information (e.g.,
detailed driving directions) relevant to the locality
of the first mobile unit. Alternatively, the first
35   mobile unit can be installed in conjunction with a
monitor that monitors the operation conditions of a

vehicle. In that configuration, the first mobile unit
can report operations or maintenance conditions of the
vehicle to other users (e.g., the second mobile unit)
through the location-relevant service server.

Ins. B3

5   ~~In one application, a user who is seeking a real~~
property can specified in the location-relevant service
server a search request for a list of real properties
for inspection. The search result can be pushed to his
cellular phone (i.e., second mobile unit, in this

10   instance) based on the position receiver (e.g. GPS
receiver) installed in his vehicle, when he arrives at
the vicinity and requests from the second mobile unit
~~his search results.~~

In addition to the GPS system, the present

15   invention can also be used in conjunction with a
terrestrial triangulation-based system. In one
embodiment, the first mobile unit receives or computes
its position using terrestrial triangulation.

Ins. a1

~~In one application, the two mobile units can be~~

20   used to authenticate a user in a business transaction.
For example, the user conducting business on a cellular
telephone can be authenticated by providing the
location-relevant service server the position of the
first mobile unit. (For example, the user is

25   conducting this transaction from his vehicle, where the
first mobile unit is installed). The location-relevant
service server can independently verified this position
by querying the first mobile unit. In such an
application, if the first mobile unit is provided a

30   display, the user can read the position off the display
and key in the position information using the keypad on
~~the second mobile unit (e.g., a cellular telephone).~~

The present invention is better understood upon
consideration of the detailed description below and the

35   accompanying drawings.

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BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows one embodiment of the present invention in a location-relevant service system 100.

5   Figure 2 illustrates a query-based operation of one embodiment of the present invention.

Figure 3 illustrates a "push-based" operation of one embodiment of the present invention.

Figure 4 shows system 400, in a second embodiment of the present invention.

10   Figure 5 shows system 500, in a third embodiment of the present invention.

Figure 6 illustrates a method for obtaining a receiver position based on the global positioning system (GPS).

15   Figure 7 illustrates a method for obtaining a receiver position based on terrestrial triangulation.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention provides access to a
20   location-relevant service from a mobile communication device based on the position of another mobile unit. Figure 1 shows one embodiment of the present invention in a location-relevant service system 100. As shown in Figure 1, a conventional mobile unit 101 for accessing
25   location-relevant service is in communication in a conventional manner with a location-relevant service server 106 over a communication or data network, such as the Internet. Mobile unit 101 consists of both position receiver 103 and communication portion 102.
30   In addition, mobile unit 101 may include a visual display panel for displaying the position information received at position receiver 103. Position information can be expressed as actual longitudes and latitudes, or simply a location code. In addition, the
35   "age" of the location information (i.e., the elapsed

time since the last time mobile unit 101 computes its
position) can also be displayed.

~~As illustrated by system 100, mobile unit 101 can~~
send its position data, for example, over a wireless

5   link 113 with wireless gateway 104. Positional data
can be received, for example, from a GPS system or a
terrestrial triangulation-based system. Figures 6 and 7
illustrate methods for obtaining a receiver position
based on a global positioning system and a terrestrial

10   triangulation system, respectively. As shown in Figure
6, in a GPS system, receiver 605 receives from
satellites 601-604 respective positions P_1, P_2, P_3 and P_4
and their times of transmission. Using its local time
t, receiver 605 computes distances S_1, S_2, S_3, and S_4,

15   which are respective distances of satellites 601-604
from receiver 605. Position P_R of receiver 605 can then
be computed conventionally as a function of P_1, P_2, P_3,
P_4, S_1, S_2, S_3 and S_4. As shown in Figure 7, under a
terrestrial triangulation method, land-based

20   transmitters 702-704 of known locations P_1, P_2 and P_3
each provide a signal from which receiver 701 computes
respective distances S_1, S_2 and S_3 between receiver 701
and each of transmitters 702-704. The position P_R of
receiver 701 can be computed conventionally as a

25   function of P_1, P_2, P_3, S_1, S_2, and S_3. In addition to
the computed position of mobile device 101, the time at
which the position was obtained can be also provided
location-relevant service server 106. This information
would allow the user or location-relevant service

30   server 106 to determine whether or not a more or less
frequent update is necessary. The direction of travel
of mobile unit 101 can also be provided to location-
relevant service server 106. (Direction of travel can
be used, for example, in a driving direction service to

35   provide more accurate "turn by turn" ~~driving directions~~

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-- i.e., additional turns may be necessary to reorient
the vehicle towards the destination)

    Wireless gateway 104 relays the position data from
mobile unit 101 over the Internet to location-relevant
5   server 106 over via internet gateway 105. As in the
system described in the Copending Application
incorporated by reference above, location-relevant
server 106 is accessible over the Internet by desk top
client device 112 (e.g., a desktop computer) using
10 conventional internet connection 111. Desktop client
device 112 can be used to control subsequent processing
of the position data received at location-relevant
service server 106.

    Unlike prior art systems, however, system 100
15, allows a second mobile device 110 (e.g., a cellular
telephone, a personal digital assistant, or a laptop
computer) to access information or service provided by
location-relevant service server based on the position
of mobile unit 101. As shown in Figure 1, location-
20 relevant service server 106 provides location-relevant
information to mobile device 110 by making such
information available at an information depository 107
(e.g., a web server) accessible by mobile device 110
through wireless gateway 109 and internet gateway 108
25 via wireless link 119 and conventional data
communication links 117 and 118. In one embodiment, a
user can access information depository 107 using a
browser adapted for a wireless communication protocol
(e.g., WAP).   (Although shown here as separate units,
30 information depository 107 and location-relevant
service server 106 can be implemented by the same
server unit).

    To access location-relevant service based on the
position of mobile unit 101, the user of mobile device
35 110 provides authentication information (e.g., user
identification and password) to location-relevant

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service server 106. After establishing that the user of mobile device 110 has the requisite rights, location-relevant server 106 provides location-relevant service to the user of mobile device 110.

5   System 100 can operate under at least two modes of operations: "query-based" and "push-based" operations. Figure 2 illustrates a query-based operation of one embodiment of the present invention. As shown in Figure 2, under a query-based operation, location-

10   relevant service is provided only when the user of mobile device 110 sends out a request for location-relevant service (step 201). At step 202, where location-relevant service server 106 receives the service request, it determines (step 203) if it

15   requires an update of the position of mobile device 101. If an updated position is required, a request is sent to mobile device 101 to obtain mobile device 101's current position. Otherwise, at step 205, the most recently acquired position information stored at

20   location-relevant service server 106 is used. Regardless of whether an update is obtained, the position data is used to render location-relevant service (step 206). Results or returned information is then provided to the user at mobile device 110 (step

25   207).

       Figure 3 illustrates a "push-based" operation of one embodiment of the present invention. Under the push-based operation of Figure 3, at steps 301 and 302, mobile device 110 receives a command for a selected

30   location-relevant service and enables the corresponding service at location-relevant service server 106. The selected service can be activated according to some conditions, such as a specified position reported by mobile unit 101. At the same time, at regular time

35   intervals, mobile unit 101 provides its current position to location-relevant service server 106.

Location-relevant service server 106 waits on the
specified conditions for triggering the selected
location-relevant service (steps 303 and 304). When
the conditions for the selected service are met, the

5   selected service is performed in accordance with the
position of mobile unit 101 (step 305). Depending on
whether the selected service is to remain active (e.g.,
prior to the expiration of a specified time period),
location-relevant service server 106 returns to wait

10   for the triggering conditions (step 306), or proceed
with other location-relevant services (step 307), as
required.

Ins.B7

Examples of other location-relevant information
that B7 can be provided includes: traffic, operating or

15   maintenance conditions regarding the vehicle,
entertainment (e.g., movies or shows played at nearby
cinemas or theaters) or travel-related information
(e.g., locations of nearby hotels, points of interests,
gas stations, restaurants, driving directions etc.) In

20   system 100, for example, prior to a trip, a user can
specified from his desktop personal computer a list of
location-related service requests. The user seeking to
buy real estate, for example, may set requests for
locations of open-house events, which will then be

25   downloaded to mobile device 110 in the form of a paging
message or an email, when mobile device 101 - which is
installed in the user's car - arrives at the specified
geographical vicinity.

Ins.B8

The information at location-relevant service

30   server 106 can be shared among users for many purposes.
For example, the present invention provides a method
for authentication for on-line transactions. For
example, a user completing an on-line transaction with
mobile device 110 can sign the transaction using the

35   position data displayed on the display panel of mobile
unit 101. The elapsed time since the position data was

obtained can also be displayed on the display panel and
used to achieve further robustness. The other party to
the transaction can authenticate the user through
location-relevant service server 106, which

5   independently query mobile unit 101 to obtain its
position.

In system 100, mobile unit 101 and mobile device
110 communicate via separate wireless links 113 and
119. However, the operations described above and the

10   attendant benefits can be achieved similarly using
systems 400 and 500 of Figures 4 and 5, respectively,
in alternative embodiments of the present invention.
To simplify the following discussion and to avoid
repetition, like elements in Figures 1, 4 and 5 are

15   provided like reference numerals. In each of systems
400 and 500, rather than mobile device 101 sending
positional data to location-relevant service server 106
via an independent communication link, the position
information data of mobile device 101 and communication

20   between mobile device 110 and location-relevant service
server 106 share a common wireless link and an internet
gateway. In system 400, mobile unit 101 and mobile
device 110 communicate with each other over wireless
link 402, and communicate with location-relevant

25   service server 106 through mobile unit 110.
Alternatively, as shown in Figure 5, mobile unit 101
and mobile device 110 communicate over a wired link
501, and communicate with location-relevant service
server 106 through mobile 101's wireless link 113.

30   Wired link 501 can be implemented, for example, by a
docking station through a standard interface. For
example, if mobile unit 101 is a lap top or a personal
digital assistant, such an interface can be provided by
a 1394 serial bus interface. As in Figure 1, in

35   systems 400 and 500, location-relevant service server

107 can be accessed from non-mobile or desktop client 112.

The above detailed description is provided to illustrate specific embodiments of the present
5   invention and is not intended to be limiting. Numerous modifications and variations within the scope of the present invention are possible. The present invention is set forth in the following claims.